[redacted] Document No. A
Copy 1 of 2

[redacted]

May 27, 1966

Ref: 269/PLI-82 [redacted]

NPIC/PO

[redacted]
P. O. Box 6788
Fort Davis Station
Washington, D. C. 20024

Attention [redacted]

Reference [redacted] Subject: Revised Test Plan Printer #1

Gentlemen:

Submitted herewith for your approval is the Revised Test Plan for the Contact Duplicating Printer. We are also enclosing a two page summary of the differences between this revision and the previously approved Test Plan.

May we call your attention to page 11 of the Test Plan which lists the test film to be used. Test rolls numbers 1, 2, 4, and 5 have not been submitted to you for your approval. The remaining rolls have been approved by you for their intended use.

We would appreciate your immediate consideration of this matter and approval of this revised Test Plan because of the rapidly approaching date for the acceptance test.

Yours very truly,

[redacted]

WK:em

1 Copy Enclosed
5 Copies Technical Monitor

Differences Between Original and Rev. #1 of Test Plan

(Reference Rev. #1, dated May, 1966)

1. Page 1, Para. 1: Indicates revision and inclusion of numbered test rolls of film.

2. Pages 3 & 4: Description - test run #1
   Test identical except for more detail.
   Paragraph 1.13 was added to test the frame separation detector.

3. Page 5: Description - test run #2
   Test identical except for more detail.

4. Page 6: Test Run #3

   For the sake of simplifying the acceptance tests, nine resolution targets will be distributed over the 9" x 30" platen, 2 exposures will be made, and each target will be read by three observers, resulting in a total of 54 vertical and 54 horizontal readings. These will be averaged.

   Page 6: Description, Test Run #3

   Additional detail provided.

5. Page7: Description - Test Run #4

   More detail is provided, and the following correction was made:
   5427 film will be used for demonstrating printing speed in accordance with the Ammendments to the Design Plan, dated March 11, 1965, paragraph 6.0.
   Film type 8430 will be used for exposure control tests, as designated in paragraph 3.8 of the Purchase Description.

6. Page 9 Description - Test Run #5
More detail is provided. A typographical correction was made in the use of 8430 film instead of 8439 film as incorrectly specified.

7. Page 10 Description Test Run #6
Additional detail is provided.

The paragraph where motor torque is measured has been deleted, as the transport in its present design configuration does not adapt itself to this type of measurement. Film under tests 1 through 6 will adequately demonstrate transport operation.

TEST PLAN

for

CONTACT DUPLICATING AND RESEAU PRINTER

Prepared for

THE UNITED STATES GOVERNMENT

by

[redacted]

25X1

June, 1965

Revision #1 - May, 1966

INTRODUCTION

This Revised Test Plan is submitted for approval and is intended to clarify and amplify the approved Test Plan.

The Test Plan describes test methods and procedures to be used to determine conformance with the performance requirements of the purchase description.

The Test Plan procedures will be demonstrated by [redacted] representatives in the presence of government inspectors at the point of manufacture prior to delivery and acceptance at FOB point, and a detailed report of the test results will be delivered with the Printer in accordance with Paragraph 4.2 of the Purchase Description. 25X1

In order to demonstrate compliance with the numerous contract requirements in a reasonable span of time, the Test Plan procedure will be essentially a test demonstration to spot-check or sample the capability of the Printer in all of its specified requirements. Realizing that a single satisfactory test result does not indicate conformance to a particular specification, it is anticipated that a statistically representative quantity of test data will be accumulated, compiled, and organized in notebook form prior to formal demonstration such that one or several successful tests in the presence of the monitors will be acceptable as proof of compliance to a particular specification. Where specific test roll numbers are designated, these refer to the test films itemized on page 11.

A. Test Run #1

1.0 This test will effectively demonstrate compliance with the following contractual requirements:

1.1 The Printer shall demonstrate capability to accommodate 70mm width film.

1.2 The Printer shall demonstrate capability to accommodate formats of 70mm x 5" with appropriate masking.

1.3 The Printer shall demonstrate capability to operate in an Automatic Mode with both negative and positive images.

1.4 The Printer shall demonstrate the capability to operate with emulsion-to-emulsion contact.

1.5 The Printer shall demonstrate capability to automatically transport duplicating film from left-to-right in 1/4" (or less) increments from 5" to 30".

1.6 The Printer shall demonstrate the capability for safelight loading and daylight operation.

1.7 The Printer shall demonstrate the capability for automatic metering and positioning of negative and positive frames in the Automatic Mode.

1.8 The Printer shall demonstrate the capability for manual cutting and removal of partially-exposed rolls of duplicating film.

1.9 The Printer shall demonstrate the capability to operate from a 120/208 volt, 60 cycle, 3 phase, 4-wire power source with customer facilities provided for power, compressed air, vacuum, and exhaust ductwork.

1.10 The Printer shall demonstrate the capability to accommodate input and output film thicknesses of approximately 2.5 to 7.0 mils.

B. DESCRIPTION - TEST RUN #1

1.1 Load the Printer with test roll #1, 2.5 mil, 2¼ x 2¼, 70mm negatives. Load emulsion up in the film gate in accordance with the Operator's Manual, Section 4-74.

1.2 Install the 5" frame mask.

1.3 Install a roll of 70mm type 8430 dupe film, in accordance with the Operator's Manual, Section 4-72. Set the increment control for 5".

1.4 With the lower transport drawer out, advance the input film manually until the first two negative frames are centered in the mask.

1.5 Close the transport drawer and turn on the room lights.

1.6 Operate the "Dodging-On" pushbutton, and set the exposure factor control for the predetermined exposure setting (normal).

1.7 Set the "Prints-per-Frame" control to Position 1 and depress "Auto" and "Auto-Start". During the fifth exposure, depress and hold the "Auto-Stop" button until the fifth print cycle has been completed and the Printer stops.

1.8 Turn off the room lights and turn on the safelight. Open the negative transport drawer and rewind and remove the input test film. Advance the Raw Stock beyond the last exposed frame, and cut and remove the exposed section. Rethread the remaining raw stock.

1.9 Install the roll of 70mm positive film #2, as in steps (1.1), (1.2), (1.4) and (1.5) above.

1.10 Advance the dupe film 30 inches, allow a 30-inch section to remain on the platen for 1 minute with the room lights on, and then repeat Step 1.7 above after setting the exposure factor control for the predetermined exposure (normal).

1.11 Turn off the room lights and turn on the safelight. Open the negative transport drawer and rewind the input test film.

1.12 Advance the raw stock beyond the last exposed frame, and cut and remove the exposed section. Remove the roll of raw stock and turn on the room lights.

1.13 Load the Printer successively with test negative and positive rolls #101-L, 102-L, 103-H, 110-L, 111-H, 113-L, and visually observe metering and positioning of negative and positive frames with the Frame Separation Detector controls set to the appropriate positions for each roll. Label and record each frame that is skipped, and label and record any section of film that is stopped as a "false frame".

1.14 Process the film from Sections 1.8 and 1.12 above in accordance with manufacturer's recommendations: (5 minutes in D-76 at 68°F. for a gamma of $\approx$0.9).

1.15 Examine the film frame for proper spacing and absence of fog. Examine the 30-inch section for absence of fog.

C. Test Run #2

2.0 This test will effectively demonstrate compliance with the following contractual requirements:

2.1 The Printer shall demonstrate capability to accommodate films up to 9½" wide and roll lengths up to 500 feet.

2.2 The Printer shall demonstrate capability to accommodate formats up to 9" x 30".

2.3 The Printer shall demonstrate capability to operate in the Reseau (or Manual) Mode with the Reseau Grid in place.

2.4 The Printer shall demonstrate capability to operate with the negative film emulsion facing down, toward the Reseau Grid platen.

2.5 The Printer shall demonstrate capability to accommodate input and output film thicknesses of approximately 2.5 to 7.0 mils.

2.6 The Printer shall demonstrate capability for transport of negative film at both high and low speeds with the negative transport drawer open.

2.7 The Printer shall demonstrate capability for exposing a Reseau Grid onto the duplicating film with an output line width of 12 to 15 microns when projected through a negative having a broad range of densities, with a film thickness of approximately 7 mils. Line widths are to be measured by microscope or comparator at ten discrete points.

D. DESCRIPTION - TEST RUN #2

2.1 Set up the Printer for Reseau Printing in accordance with the Operator's Manual, Section 4-87 to 4-90. The input film will be test roll # 4, a 500' roll of 9½", 7 mil thick film, containing at least five 9 x 30 formats. The image-bearing portion of the roll will be pre-punched and will be loaded into the printer emulsion down.

2.2 With the room lights "off" and the safelight "on", load the Printer with approximately 100' of 8430, 9½" duplicating film in accordance with Paragraph 4-73. The 9 x 30-inch mask will be utilized. The exposure timer will be set for a predetermined exposure time. Record value _____.

2.3 Make three successive manual prints in accordance with the Operator's Manual, Sections 4-91 and 4-92.

2.4 Cut and remove the exposed film section. Remove the roll of duplicating film.

2.5 Rewind and remove the input film.

2.6 Process the 2-30 inch sections of film in accordance with manufacturer's recommendations (5 minutes in D-76 at 68°F. for a gamma of ≈ 0.9).

2.7 Examine the output film under a light table for proper exposure of the reseau lines. Measure and record the line widths at 10 random points.

E. Test Run #3

3.0 This test will effectively demonstrate compliance with the following contractual requirements:

3.1 The Printer shall demonstrate capability for achieving sufficient contact pressure and for producing resolution of at least 300 lpm with emulsion-to-emulsion contact. A statistical distribution will result from the three resolution readings taken in each of nine positions over the format. Readings are to be taken by representatives of the Government, [redacted] 25X1
25X1 [redacted] The lowest of the vertical and horizontal readings shall be utilized and an average of the observers' readings recorded. Fifty percent or more of all readings shall be over 300 lpm for acceptability.

3.2 The Printer shall demonstrate capability to select a given number of duplicate prints in any quantity up to ten.

F. DESCRIPTION - TEST RUN #3

3.1 Insert over the clear platen with emulsion side up, a 9" x 30" format of nine or more resolution targets of at least 400 LPM.

3.2 Operate the "Dodging Off" button and set the exposure timer for a predetermined exposure value, which optimizes the resolution characteristics. Make two exposures. Notch, or mark the raw stock for cutting when processing.

3.3 Cut and remove the exposed raw stock in accordance with the Operator's Manual. Cut the film for convenient processing lengths. Process in D-19 for three minutes at 68°F.

3.4 After processing, read and record the resolution values of all the targets.

G. Test Run #4

4.0 This test will effectively demonstrate compliance with the following contractual requirements:

4.1 The Printer shall demonstrate capability for Automatic Exposure Control. A subjective comparison of prints from the two methods of exposure will demonstrate Printer capability for automatic exposure control of incremental areas.

4.2 The Printer shall demonstrate capability for duplicating negatives of 9" x 30" format at the rate of at least six per minute.

H. DESCRIPTION - TEST RUN #4

4.1 Load the Printer with test roll # 3, 9½" exposure control test films. Load emulsion up in the film gate in accordance with the Operator's Manual, Section 4-74.

4.2 Install the 9" x 30" frame mask.

4.3 Install at least 50' of 9½" type 5427 dupe film, in accordance with the Operator's Manual, Section 4-72. Set the increment control for 30-inch frames.

4.4 With the lower transport drawer out, advance the input film manually until the first negative frame is centered in the mask.

4.5 Close the transport drawer and turn on the room lights.

4.6 Operate the "Dodging-On" pushbutton and set the exposure factor control for the printing speed for 5427 film.

4.7 Place the machine on "Automatic Mode", set the number of prints control for six copies, and operate in accordance with the Operator's Manual, Section 4-80. By means of a stopwatch, measure and record the time for printing six copies.

4.8 With the number of prints control set for one copy, the exposure control factor control set for 8430 film, and the raw stock increment control set for 30-inch frames, operate the printer in accordance with the Operator's Manual, Section 4-84 with 8430 dupe film installed as in step 4.3.

4.9 Operate the Printer in accordance with the Operator's Manual, Section 4-82, with the exposure timer control set for the predetermined exposure.

4.10 Repeat steps 4.8 and 4.9 with other selected negatives in the gate.

4.11 At the conclusion of the tests, turn off the room lights and turn on the safelight. Open the negative transport drawer and rewind the input test film.

4.12 Advance the raw stock beyond the last exposed frame and cut and remove the exposed section. Remove the roll of raw stock and turn on the room lights.

4.13 Process the film from Sections 4.8 to 4.10 in accordance with manufacturer's recommendations: (5 minutes in D-76 at 68°F. for a gamma of $\approx$0.9). If a tank is used, process according to manufacturer's recommendations.

4.14 Examine the prints that were dodged and undodged.

I. Test Run #5

5.0 This test will effectively demonstrate compliance with the following contractual specifications:

5.1 The Printer shall demonstrate capability to expose a Reseau Grid so that the centrally reproduced line shall be no more than $\pm$ 5 microns from the referenced frame fiducial or reference grid line on the special pre-punched negative. Comparator or microscope measurement shall be used to measure accuracy of Reseau printing. Measurement shall be made in the same area on the reproduced grid as was viewed and punched on the special grid negative.

5.2 The Pre-View and Punch Station shall demonstrate capability for viewing, aligning, and punching one hole in the border of the negative film to a fixed distance from a fiducial or reference grid line such that subsequent print-out will show the central Reseau line to be within $\pm$ 5 microns from the reproduced fiducial or reference grid line.

J. DESCRIPTION - TEST RUN #5

5.1 Set up the Printer for Reseau Printing in accordance with the Operator's Manual, Section 4-87 to 4-90. The input film will be three special grid negatives containing a pair of crossed grid lines on a medium density background. The films will be previously punched on the Pre-View and Punch Station by following the instructions for punching in the Operator's Manual, Section 4-62, for a 9" x 9" frame. Load the first test film into the printer emulsion down.

5.2 With the room lights "off" and the safelight "on", load the Printer with at least 50 feet of 8430, 9½-inch dupe film in accordance with Paragraph 4-73 of the Operator's Manual. The 9 x 9-inch mask will be utilized. Exposure will be manual, and the exposure timer will be set for a predetermined exposure time to optimize printing of the reseau lines.

5.3 Make three successive manual prints utilizing each of the three test films in succession.

5.4 Process the films in accordance with manufacturer's recommendations (5 minutes in D-76 at 68°F. for a gamma of ≈ 0.9).

5.5 Examine the output dried films under a microscope equipped with a calibrated reticle. Measure and record the dimension between the central reseau grid and the test grid line. Three readings will be taken for each test film and will be averaged. Record and compare all readings.

K. Test Run #6

6.0 This test will effectively demonstrate compliance with the following contractual specifications:

6.1 The Printer shall be designed to prevent damage to the original film input to the maximum extent possible.

L. DESCRIPTION - TEST RUN #6

6.1 Utilizing approximately ten feet of clean, unexposed Type #8430 film, mark off three areas at random of approximately 9" x 9". Visually examine the selected areas for scratches, and delineate and record such imperfections.

6.2 Load the film sample onto the negative transport of the Printer with emulsion side up, and make a simulated series of 30"-long exposures in the Manual Mode (since there are no frame edges) with corresponding advance of duplicating film. Upon reaching the end of the film sample, remove the ten-foot length and visually re-examine the delineated areas to determine the extent of any damage to the original film incurred during Printer operation.

6.3 For the purpose of this test, an objectionable scratch shall be defined as a single scratch or rupture of the base or emulsion which extends for more than two feet of film or a scratch which appears periodically at the same point of every simulated frame for more than two feet of film. Record results.

TEST FILM

TEST ROLL #	DESCRIPTION
1	Approximately 50 feet of 2.5 mil, 70mm width film with twelve 2¼ x 2¼ negative frames
2	Approximately 50 feet of 2.5 mil, 70mm width film with twelve 2¼ x 2¼ positive frames
101-L	Approximately 50 feet of 2.5 mil, 9½" width film with 9" x 18" negative frames
102-L	Approximately 50 feet of 5.5 mil, 9½" width film with 9" x 9" negative frames
103-H	Approximately 50 feet of 5.5 mil, 9½" width film with 9" x 9" positive frames
110-L	Approximately 250 feet of 5.5 mil, 70mm width film with negative frames 2½" x 9½"
111-H	Approximately 500 feet of 5½ mil, 70mm width sprocketed film, with 2½" x 9½" positive frames
113-L	Approximately 250 feet of 5½ mil, 5-inch width film with 4½" x 4½" negative frames
3	Approximately 25 feet of 5½ mil, 9½-inch width film with twelve 9" x 9" and 9" x 18" negative and positive frames of various densities for exposure control tests
4	Approximately 500 feet of 7 mil clear mylar leader for transport tests
5	9" x 30" piece of 7 mil mylar film with crosshair image on medium density background for testing preview and punch station

DATA SHEET FOR

CONTACT DUPLICATING AND RESEAU PRINTER

TEST PLAN, DATED _____ REVISION NO. ___

TEST RUN NO. _____

SECTION	DATA

Test Engineer _____ Date _____

25X1 Witness: _____

U.S. Government _____

HIGH RESOLUTION STEP & REPEAT CONTACT PRINTER

SIZE 6' x 8' x 3½'

WEIGHT 1900 LBS

STRUCTURE ALUMINUM FRAME CONSTRUCTION WITH HINGED LIGHT-TIGHT COVERS

FILM ACCOMMODATION

FILM WIDTHS 70 MM, 5 IN, 6.6 IN, 8 IN & 9½ IN

FILM LENGTH UP TO 500 FT ROLLS OF NEGATIVE & PRINT FILM ON MIL-STD SPOOLS

FILM THICKNESS FROM 2.0 TO 7.5 MILS

FORMAT CONTINUOUSLY VARIABLE FROM 2¼" x 5" TO 9" x 30"

RESOLUTION 400 LINES/MM ANYWHERE ON THE PRINTED FRAME WHEN USED WITH RECOMMENDED FILM TYPES

SPEED 10 FRAMES/MIN. WHEN USED WITH RECOMMENDED FILM TYPES. SAFE HIGH SPEED NEGATIVE REWIND

EXPOSURE AUTOMATIC EXPOSURE CONTROL WITH OPTIONAL OPERATOR OVERIDE

DISTORTION OF IMAGE LESS THAN 0.01%

DUTY CYCLE 90%

VIEWER VISUAL VERIFICATION OF NEGATIVE FRAME BY OPERATOR

POWER 3300 WATTS AT 208 VOLTS, 3 Ø, 60 CPS. POWER

25X

MODES OF OPERATION

AUTOMATIC

SELECTIVE

MACHINE AUTOMATICALLY PRINTS SELECTED QUANTITY OF PREDETERMINED FRAMES. PRINTER IS OPERATOR PROGRAMMED TO FIND ANY DESIRED FRAME. ALL FRAMES PRECISELY POSITIONED ELECTRONICALLY, AND CAN BE VISUALLY VERIFIED.

SEQUENTIAL

MACHINE IS OPERATOR PROGRAMMED TO PRINT 1-40 OR UNLIMITED COPIES OF EACH NEGATIVE FRAME IN SEQUENCE. ALL FRAMES ARE PRECISELY POSITIONED ELECTRONICALLY, AND CAN BE VISUALLY VERIFIED.

MANUAL

MACHINE IS OPERATOR CONTROLLED TO PRINT 1-40 OR UNLIMITED COPIES OF ANY MANUALLY SELECTED FRAME IN ANY SEQUENCE. ALL FRAMES ARE PRECISELY POSITIONED, AND CAN BE VISUALLY VERIFIED.

CONTACT DUPLICATING & RESEAU PRINTER

DESIGN OBJECTIVES

- AUTOMATIC STEP & REPEAT CONTACT PRINTING.
- ELECTRONIC POSITIONING OF FILMS.
- SEMI-AUTOMATIC RESEAU OR SELECTIVE PRINTING MODES.
- AUTOMATIC EXPOSURE CONTROL ON A GROSS-AREA BASIS.
- SEPARATE PRE-VIEW & PUNCH STATION.
- CLEAN-ROOM OPERATION & INTERIOR.
- SIZE: 2.5' x 6' x 4' HIGH.
- WGT: APPROXIMATE 1500 LBS.
- CONTINUOUS PRODUCTION TYPE UNIT.

PERFORMANCE GOALS

- RESOLUTION: 300 LINE PAIRS PER MILLIMETER.
- PRINTING RATE: SIX PRINTS PER MINUTE.
- FORMAT 2¼" x 2¼ UP TO 9" x 30"
- CAPABILITY: 70 MM TO 9½" WIDE FILM.
- MASKING: VARIABLE FOR FRAME SIZE.
- SELECTION: ONE TO TEN PRINTS PER NEGATIVE FRAME.
- CAPACITY 500 FT. SPOOLS.
- ACCURACY: RESEAU PRINTING REPETITION TO ±5 μ
- DESIGNED FOR RFI SUPPRESSION, MINIMUM FILM DAMAGE OR DISTORTION.

CHARACTERISTICS OF HIGH-PERFORMANCE STEP & REPEAT CONTACT PHOTOGRAPHIC PRINTERS

	PRINTER NO. 1		PRINTER NO. 2	
REQUIREMENT	SPECIFICATION	TEST	SPECIFICATION	TEST
PRINTING RATE	6 FPM	UP TO 15 FPM	10 FPM	> 10 FPM
RESOLUTION	300 LPM (WITH HIGH CONTRAST INPUT	356 LPM (SO 267)	400 LPM (WITH HIGH CONTRAST INPUT)	> 528 LPM (SO 267)
FRAME SIZE	70MM x 5" TO 9-1/2" x 30"	MET	70 MM x 5" TO 9-1/2" x 30"	MET
CAPACITY	500' OF NEGATIVE 500' OF DUP. FILM	MET	500' OF NEGATIVE 500' OF DUP. FILM	MET
DENSITY RANGE	NONE SPECIFIED	SAME AS PRINTER 2	ACCOMMODATE INPUT DENSITY OF 0.05 ABOVE FOG TO 3.2	MET
AUTOMATIC EXPOSURE CONTROL	MUST BE PROVIDED	96 GE 1385 LAMPS WITH INDIVIDUAL SENSORS ABOVE THE FILM, TIME VARIABLE	MUST BE PROVIDED	SCANNING U.V. APERTURE LAMP, INTENSITY CONTROLLED BY SYNCHRONIZED PHOTOSENSORS ABOVE THE FILM
FRAME POSITIONING	FRAME SENSING	OPERABLE ON POSITIVE OR NEGATIVE FILM BOUNDARIES	FRAME SENSING	OPERABLE ON NEGATIVE FILM BOUNDARIES
DISTORTION	MINIMUM DISTORTION OF ARCHIVAL FILM	FILM TENSION BELOW MANUFACTURERS RECOMMENDED LIMIT	LESS THAN .01 %	MET MAX FILM TENSION ≈ 0.5#/IN. OF FILM WIDTH
FEATURES	COMPANION PRE-VIEW AND PUNCH STATION MUST NOT ADD TO CLEAN ROOM CONTAMINATION	OPTION OF RESEAU PRINTING. CLEAN ROOM DESIGN RFI SELECTED COMPONENTS		VIEWING STATION INCORPORATED RFI SELECTED COMPONENTS

PRINTER I
ADDITIONAL COST DETAILS
COST IN THOUSANDS

CHANGE IN SCOPE

	RED.	ADD.
SPARE RESEAU & CLEAR PLATEN		
5X1 FRAME EDGE SENSOR		
RFI		
5X1 TRANSPORT		
TOTAL		
NET TOTAL		

25X

25X

OVERRUN

ADDITIONAL RESEARCH AND LIAISON REQUIRED IN SUPPORT OF CONTRACT FOR:

25X

LIGHT SOURCE
EXPOSURE CONTROL
PREVIEW & PUNCH STATION

PRINTER II
ADDITIONAL COST DETAILS
COST IN THOUSANDS

CHANGE IN SCOPE	REDUCTION	ADDITION
RFI		
COLOR PRINTING & PAPER ACCOM.		
FILM CODING		
VIEWER & MASK		
TRANSPORT		
1. FRAME SEPARATION SENSING		
2. FOOTAGE COUNTER		
3. FRAME COUNTER		
4. SLEW CONTROL		
ELECTRONIC CONTROLS		
1. FRAME SELECTION		
2. CONTROL PANEL		
3. PRINTER CONTROLS		
4. PRINTER RATE		
5. FILM LENGTH		
INTERIOR ENVIRONMENT		
ADDITIONAL INDUSTRIAL DESIGN		
TOTALS		

TOTAL CHANGE IN SCOPE
STOP WORK
START WORK

TOTAL CHANGE IN SCOPE

OVERRUN : UNDERESTIMATE OF ORIGINAL DRAFTING EFFORT

Next 1 Page(s) In Document Exempt

Approved For Release 2005/06/23 : CIA-RDP78B04770A001600020011-2

COMPARISON OF U.V LAMP-FILM SPECTRAL CHARACTERISTICS